interconnection of competing local exchange networks;

(3) Minutes of use interconnection charges would not be sustainable in a highly competitive market;

(4) Minutes of use interconnection charges fail to attain maximum efficiency and lead to incorrect investment signals;

(5) Minutes of use interconnection charges have been used in the past as a convenient allocator for fully distributed cost under regulated monopoly, but are not appropriate in the emerging market structure of greater competition;

(6) In order to facilitate the transition to a competitive communications market, regulators should emulate the competitive market outcome by setting interconnection prices (if "sender keep all" is not acceptable) determined by the cost of providing the necessary capacity for terminating traffic.

INCREMENTAL COST OF LOCAL USAGE

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Summary

A reasonable estimate of the average incremental cost of local usage (and therefore the cost of terminating traffic received from a competitor) using digital technology is 0.2 cents per minute. That estimate is based on studies done by or supported by telephone companies. The cost is determined by peak period capacity and therefore the true cost is considerably higher than the 0.2 cents per minute average during the peak period and is zero during the non-peak period.

I. Introduction

In a separate paper prepared for Comcast, I have argued that the theoretically correct interconnection charge is cost based mutual compensation. However, cost can have many different meanings and in a regulatory context, cost based requirements can lead to interminable regulatory proceedings and disputes. Policy makers have consequently frequently sought structural methods of solving problems that do not require detailed oversight of cost rules.

One proposed structural rule is mutual compensation without oversight of actual rates, but as shown in the Comcast paper that approach is inadequate to limit the exercise of monopoly power. An alternative approach that dispenses with direct control of cost is the policy of "sender keep all" or "bill and keep" in which each party agrees to terminate traffic for the other without payment for terminating service. That is equivalent to mutual compensation with a zero price for compensation. It will be economically efficient if <u>either</u> of two conditions are met: (1) Traffic is approximately balanced in each direction; (2) The actual costs are very low so that there is little difference between a cost based rate and a zero rate.

Existing publicly available studies suggest that the incremental cost of local usage (and therefore the cost of terminating traffic from a competitor) is on average approximately 0.2 cents/minute. The actual cost is considerably higher during the peak period and zero during the off peak period. Thus it would not be efficient or desirable to charge at 0.2 cents/minute on a usage basis. However, the very low average number compared to the price currently charged by local exchange companies suggests that far greater distortions are likely from mutual compensation without control of rates than from sender keep all approaches.

There are two basic methods for estimating cost:

(1) engineering studies of the forward looking cost to supply a particular service;

(2) econometric (statistical) studies of the relationship between observed cost and observed outputs.

Both engineering and econometric studies provide useful information on cost. The engineering study allows one to focus on best practice technology and compute the incremental cost of adding capacity to provide a particular function. Econometric studies provide a reality check by using observed output and cost data rather than projections of expected cost. However, econometric studies may produce less precise estimates of the incremental cost of a particular service than engineering studies because they are measuring the correlation between variations in the total cost of different telephone companies and variations in the quantities of particular services provided by those companies. The cost data include costs for different embedded technologies used by the companies and are not precise enough to provide detailed estimates of the incremental costs of particular services with particular types of technology.

II. Engineering Estimate

The most comprehensive public engineering study of incremental cost was done by the Incremental Cost Task Force with members from GTE, Pacific Bell, the California Public

Utilities Commission, and the RAND Corporation.[1] The Task Force had access to data for telephone companies in California and performed a detailed engineering cost study for various output measures of local telephone service. Individual components were priced based on 1988 prices and costs were computed for switch investment, switch maintenance, interoffice transport, and call attempt costs. All costs were computed for calls during the busiest hour of the year because the investment and associated expenses are related entirely to capacity cost. The Task Force computed the following usage costs for each hundred call seconds (CCS) during the busiest hour of the year for "average" and "larger urban" exchanges:

switch investment	$ 5.00	-	$ 10.00	per year
switch maintenance	.20	-	.50	per year
interoffice calling	.50	-	.60	per year
Total	$ 6.00	-	$ 11.00	per year

In addition, the task force computed a cost of $ .30 to $.90 per year for each call attempt during the busiest hour of the year and estimated approximately 1.25 busy hour attempts per busy hour CCS.[2]

1 Bridger M. Mitchell, Incremental Costs of Telephone Access and Local Use, (Santa Monica, CA: The Rand Corporation, 1990); reprinted in William Pollard, ed., Marginal Cost Techniques for Telephone Services: Symposium Proceedings (Columbus, Ohio: National Regulatory Research Institute, 1991) (NRRI 91-6).

2 Ibid., p. 249, 250.

There are 8766 hours per year and the ratio of the peak usage rate to the average usage rate is approximately 3.[3] That implies that one busy hour CCS is approximately equal to 2922 CCS per year (8766/3). Because one CCS is equal to 1.67 minutes, costs per busy hour CCS can be converted into average costs per minute by dividing by 4880 (2922 total year CCS times 1.67 minutes/CCS). Thus the $6.00 - $11.00 cost per year per CCS during the busiest hour of the year translates into $.0012 - $.0023 per minute. The busy hour attempt cost adds $.375 - $ 1.125 per busy hour CCS (1.25 busy hour attempts per buy hour CCS and $.30 to $.90 annual cost per busy hour attempt), raising the total cost, including busy hour attempts, to $6.375 - $12.125, and the per minute cost to $.0013 - $.0025. Taking the middle of the estimated range gives a cost of $.0019 per minute, or approximately 0.2 cents/minute.

Because the cost is determined by the the peak capacity, the actual cost per minute is much higher at the peak and is zero at the off-peak. If, for example, one assumes that an equal size peak occurs for one hour in each business day (260 hours per year of peak usage and 8506 hours of non-peak usage), then the average cost per minute would be 2.1 cents for the 8.9 percent of the traffic that occurs during the 260 peak hours each year and the average

3 Rolla E. Park, Incremental Costs and Efficient Prices with Lumpy Capacity: The Two Product Case, (Santa Monica, CA: The Rand Corporation, 1994), p. 5.

cost per minute would be zero for the 91.1 percent of the traffic that occurs during the 8506 non-peak hours.

A variety of other engineering studies have been done for specific regulatory purposes and submitted to various state regulatory commissions. For example, New England Telephone prepared an engineering study for the Massachusetts PUC that found an incremental cost of 0.2 cents per minute for local usage served by electronic switches, the same as the Incremental Cost Task Force conclusion using California data.[4]

III. Econometric Estimate

Many econometric cost studies of telecommunication have been done, but the procedures used in most of them do not allow an estimate of the incremental cost of local service. One good econometric cost study that does provide an estimate of the marginal cost of local exchange service is the one performed in 1989 by Louis Perl and Jonathan Falk of NERA, using data from 39 companies (24 Bell and 15 non-Bell) over the years 1984-1987. They developed a statistical relationship between the total cost of the individual companies and the access lines, local usage, and toll usage provided by the companies.

Four different models were used for the statistical estimation. In two of the models, the data for each company

4 Reported in Lewis J. Perl and Jonathan Falk, "The Use of Econometric Analysis in Estimating Marginal Cost," in Pollard, Marginal Cost Techniques, op. cit.

was averaged over the four year period to eliminate the effects of minor year to year fluctuations and to provide a pure cross section estimate. In the other two models, observations were used for each company in each of the four years creating a mixture of time series and cross section observations. In two of the models, calls were used as the unit of usage measurement and in the other two calls minutes were used as the unit of usage measurement.

The estimated marginal costs for local minutes ranged from 0.2 cents per minute to 1.3 cents per minute. The costs per call developed in the models using number of calls as the usage unit were divided by the average holding time to produce estimates of cost per minute comparable to the those from the models using number of minutes as the usage unit. The lowest estimate came from the model with only cross section observations averaged over the four years. The highest estimate came from the model using all observations in a pooled cross section and time series and using calls as the unit of usage measurement. All four models had good statistical properties. Although there are various advantages and disadvantages of each of the four models, none of the four can be identified as either the clearly correct approach or an approach to be discarded.

The statistical form used by Perl and Falk generates marginal cost numbers approximately equal to average cost numbers. Thus it should be expected that their estimates will be somewhat higher than the engineering estimates of marginal or incremental cost. Furthermore, the engineering estimates generated by the Incremental Cost Task Force were developed based on digital switching technology while the Perl and Falk estimate for local minutes served by electronic switches was based on the embedded technology in 1984-87 which was primarily analog. It is likely that the incremental costs of usage capacity for analog switching are higher than the incremental costs of usage capacity for digital switching.

IV. Conclusion

A reasonable estimate of the average incremental cost of terminating traffic using digital switches is 0.2 cents per minute. That estimate is supported by the engineering studies done with data for California and for Massachusetts and by one of the econometric models developed by Perl and Falk. Other reasonable econometric models using embedded cost data produce somewhat higher cost estimates. The cost is determined by peak period capacity and therefore the true cost is considerably higher than 0.2 cents/minute average during the peak period and is zero during the non-peak period.

INTERCONNECTION AND MUTUAL COMPENSATION WITH PARTIAL COMPETITION

Gerald W. Brock

I. Introduction

This paper examines the economic characteristics of various interconnection compensation policies when there are different levels of market power among the participants. The conclusions of the analysis are:

(1) If there are no regulatory controls on compensation for interconnection, the monopolist of part of the market can extend its monopoly power to the entire market;

(2) A mutual compensation policy without limits on the level of rates does not limit market power;

(3) The level of rates under a mutual compensation policy is unimportant if and only if the level of incoming and outgoing traffic is exactly balanced. Because traffic levels will rarely, if ever, be exactly balanced, the level of rates will be an important factor in the viability of competition;

(4) A mutual compensation policy with prices limited to the cost of service is the theoretically correct compensation policy. Mutual compensation with prices limited to the cost of service prevents the monopolist of part of the market from extending its market power to potentially competitive sectors of the market.

(5) Capacity charges rather than per minute charges allow attention to be focused on the cost of service at the peak load which is generally the real cost of service;

(6) "Sender keep all" is an administratively simple mutual compensation scheme with zero prices for terminating service. It is an attractive approximation to the theoretically correct policy of cost based prices when the incremental cost of terminating service is low.

The issues of interconnection rights and the compensation to be paid for traffic exchanged among interconnected companies have played a crucial role in the development of competitive alternatives throughout the history of the telecommunication industry. Interconnection disputes began with the early efforts to expand market power in the mid-nineteenth century telegraph industry and have continued to the present.1 Although the long history of interconnection controversies provides several models of possible solutions to interconnection issues, the problems have not all been solved. Past interconnection controversies have led to three different kinds of solutions:

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1 A brief summary of FCC efforts to devise appropriate interconnection policies for customer premises equipment, long distance service, and international service is contained in the appendix to this paper. For a more complete account see generally Gerald Brock, _The Telecommunications Industry: The Dynamics of Market Structure_ (Harvard University Press, 1981) and _Telecommunication Policy for the Information Age: From Monopoly to Competition_ (Harvard University Press, 1994).

(1) The customer premises equipment (CPE) model of zero interconnection charges;

(2) The long distance model of substantial one-way per minute interconnection charges;

(3) The international model of two-way per minute interconnection charges.

The emerging local competition requires an interconnection policy that will allow the efficient development of a "network of networks" in which customers have access to any combination of private and multiple public communications networks. The interconnection rules to and from monopoly networks should not be dependent on technology and should apply to both wireline and wireless services. This problem is more complex than past ones because there are no clear stationary boundaries across which interconnection must occur and because there will be a need for interconnection among companies with different and changing degrees of market power.

Both the CPE interconnection rules and the long distance provider access charge rules were developed in a context in which competitors were seeking interconnection with a monopoly public network. The international model provides a closer analogy to the emerging competition in which there may not be a clearly defined monopoly public network. Traditionally, international service has been provided jointly by the national carriers with neither national carrier allowed to provide service directly into the other carrier's country. The international accounting rate and settlement rate system is a mutual compensation arrangement in which the level of payment is negotiated by the carrier pairs and that level of payment is generally used for traffic in either direction. Whatever level of payment is chosen for carrier A to compensate carrier B for terminating traffic received from A is generally the same level used for carrier B to compensate carrier A for terminating traffic received from B.

The mutual benefit and mutual compensation aspects of the international model make it appealing as a framework for interconnection of a wide variety of networks in the future. However, even the increasingly competitive future situation is likely to retain areas of monopoly power, and the international model has encountered difficulties in dealing with different levels of market power among the participants in the bargain.

With the mutual compensation approach, the actual level of payments makes no difference <u>so long as traffic is exactly balanced in both directions</u>. For example, suppose carriers A and B each originate 100 minutes of traffic to be terminated by the other. If the compensation rate for termination is $1, each pays the other $100, while if the compensation rate is $10, each pays the other $1000. In either case the payments exactly cancel out.

If traffic is unbalanced, the compensation rate does matter. If the more competitive carrier originates more traffic than it terminates (as has been the typical pattern in international communications), then a high mutual compensation rate favors the monopolist. For example, suppose low prices in competitive market B cause companies to originate 100 minutes while high prices in monopolized market A cause companies to only originate 50 minutes. Then a compensation rate for termination of $1 causes a net payment from B to A of $50, while a compensation rate of $10 causes a net payment from B to A of $500. Evan Kwerel's analysis of the international market concluded that with a net traffic outflow toward the monopolist, the mutual compensation principle does not limit the monopolist's ability to extract profit from the more competitive partner: "When the net traffic flow is out of the U.S., as with international MTS, ... U.S. carriers are making net payments to the PTT. The PTT can extract the same total revenue from U.S. carriers regardless of the terms for dividing the accounting rate by demanding a sufficiently high accounting rate."[2]

Because lower prices for calls originating in the competitive U.S. market than for calls originating in the generally monopolized foreign markets have created a net traffic outflow from the U.S., compensation rates above cost have created an increasingly large balance of payments

2 Evan Kwerel, "Promoting Competition Piecemeal in International Telecommunications," FCC, OPP Working Paper 13 (December 1984), p. 49.

deficit. Net outflow from U.S. carriers to foreign carriers increased by a factor of 10 between 1980 and 1992, rising from $347 million in 1980 to $3,344 million in 1992.[3] The rising balance of payments deficit due to compensation rates above cost has led to extensive consideration at the FCC and other U.S. government agencies of ways to attain the "objective of promoting lower, more economically efficient, cost-based international accounting rates and calling prices."[4]

II. A Framework for Analyzing Interconnection Issues

Today's communications marketplace is a hybrid with market segments of robust competition (no barriers to entry) and market segments of little or no competition (extensive barriers to entry). The problem is to create an interconnection policy that will be feasible across a wide range of situations, including different cost situations, different technologies such as wired and wireless, and different degrees of market power. The interconnection arrangements should be flexible enough to meet changing circumstances rather than having the rigidity of the existing prescribed access charge structure.

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3 FCC, Industry Analysis Division, "Trends in Telephone Service," (May 1994), Table 31, p. 48.

4 "In the Matter of Regulation of International Accounting Rates," CC Docket 90-337, 6 FCC Rcd. 3552 (1991) at 3552.

The interconnection and compensation arrangements are critical for the development of competitive benefits when there are some market segments with market power and other market segments subject to potential competition. Assume that customers can be divided into two groups: a set A for which entry is very difficult and a set B for which entry is easy. The division of the customers into two classes creates four different types of traffic:

(1) traffic among the customers in A, designated AA traffic.

(2) traffic originating from a customer in A and terminating in a customer of B, designated AB traffic.

(3) traffic orignating from a customer in B and terminating in a customer of A, designated BA traffic.

(4) traffic among the customers in set B, designated BB traffic.

The significance of interconnection policy depends upon the relative sizes of AB and BA traffic compared to AA and BB traffic. If, for example, A and B represent very different kinds of customers with no desire to communicate between the groups, then AB and BA would be very small and interconnection policy would be largely irrelevant. In that specialized case, there could be one system serving A customers and a completely separate system serving B customers with no loss in efficiency. However, in the more normal case, the division of customers between A and B is a function of geography and customer characteristics that do not affect their desire to communicate with each other. Thus AB and BA represent substantial streams of traffic and it is necessary to have interconnection among the systems in order to promote efficiency.

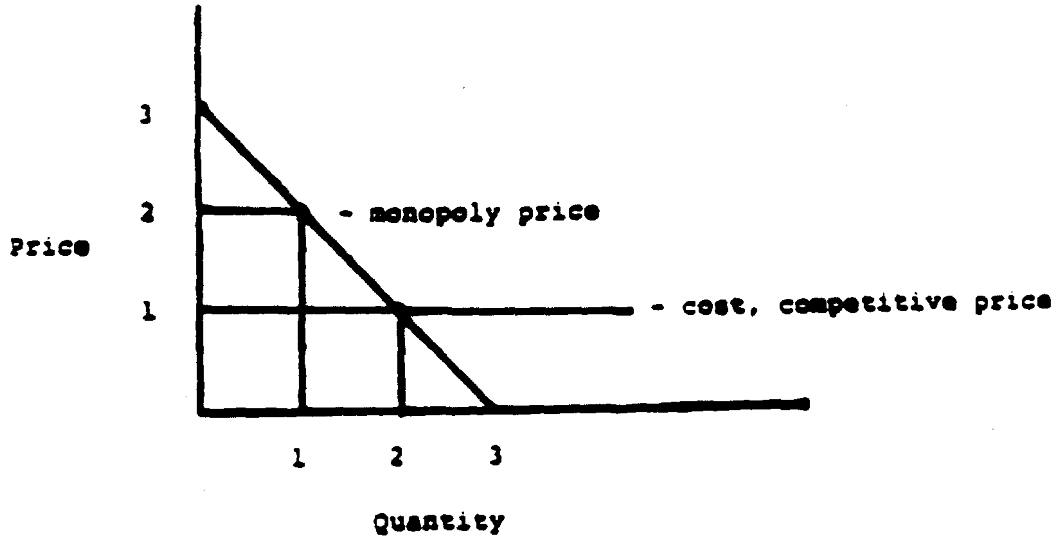
A second factor that affects the importance of interconnection policy is the existence of fixed costs per subscriber compared to costs per unit of traffic. If there are no fixed costs per subscriber (any number of subscribers can be served at the same total cost so long as the total traffic carried is the same), then interconnection policy is less important than when there are fixed costs per subscriber. With no fixed costs per subscriber, it may be efficient to serve the different traffic streams with different systems (one system for BB traffic and another for BA traffic, for example). With fixed costs per subscriber, the subscriber must choose the system that best fits that subscriber's needs. Limitations on AB and BA traffic may make a separate system for BB traffic infeasible with fixed costs per subscriber, but not with only usage costs.

The remainder of this paper examines some of the interconnection issues with a "toy model" consisting of a total universe of six subscribers who desire to communicate with each other. The simplified model allows explicit solutions to be worked out in a way that is more obvious than either more realistic simulation models or mathematical formulations. However, the results are quite general and not dependent upon the specific characteristics of the simple model presented.

Assume there are six individuals, designated 1 through 6. Each person *i* has a linear demand curve for communication with each of the other five individuals shown in Figure 1. Each person demands 3 calls per time period with each other person when the price is zero per call, 2 calls per time period when the price is $1 per call, 1 call per time period when the price is $2 per call, and at a price of $3 per call is priced out of the market. If all six people are connected in a network, the total demand of

FIGURE 1

One Person's Demand Curve for calls to one other person

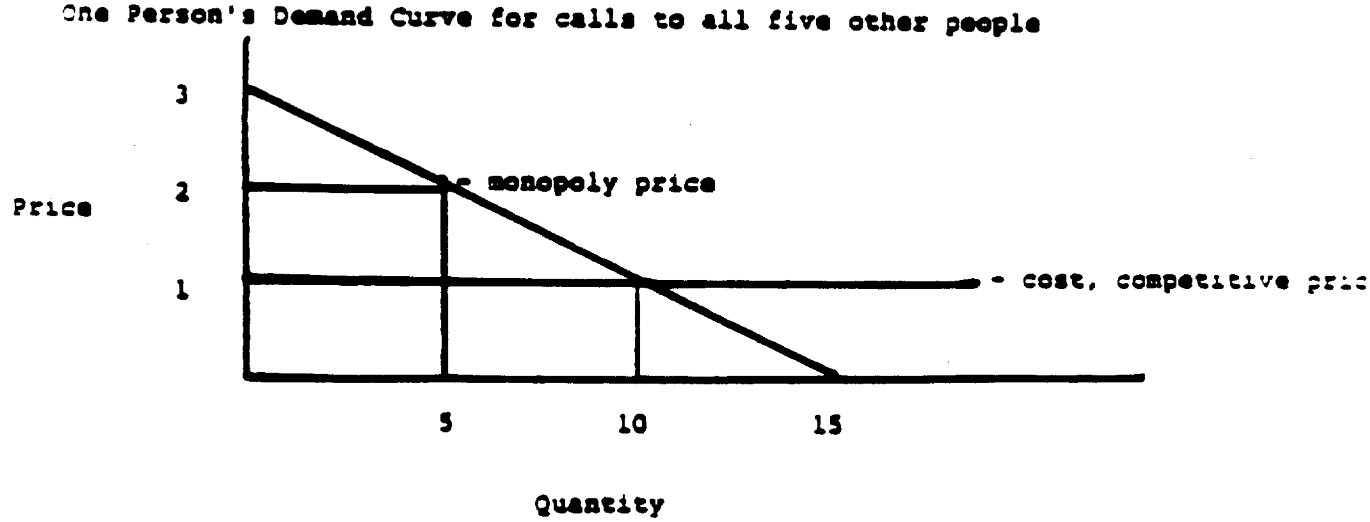


person i for communication with the other five individuals is simply the sum of i's demand for communication with each of the individuals as shown in Figure 2; person i has a demand for 10 calls per time period to the entire network at a price of $1 per call because person i desires to make two calls to each of the other five people at that price.

Assume that the cost of providing each call is $0.5 for each call originated and $0.5 for each call terminated. Thus the usage cost per call is $1 for each call carried entirely over one network and is $.5 for each call originated or terminated on the network. There are no interconnection

FIGURE 2

One Person's Demand Curve for calls to all five other people



costs for multiple networks. That is, the real interconnection cost (but not necessarily the price) of interconnection is zero, though there is a real cost to the networks of terminating traffic provided by other networks.

With a cost of $1 per complete call, the competitive price is $1 yielding a quantity demanded of 2 per person-pair or of 10 calls per person to the other people on the network. The pure monopoly price is $2 per complete call yielding a quantity demanded of 1 per person-pair or 5 calls per person to the other people on the network, as illustrated in Figures 1 and 2.[5] The monopoly price of $2 per call yields a monopoly profit of $1 per person-pair, while the competitive price of $1 per call is equal to the cost and yields no net economic profit. With no fixed costs per subscriber, the potential monopoly profit from the network is $30 (6 subscribers each making one call per time period to 5 other subscribers and generating a monopoly profit of $1 per call).

Assume that the incumbent is the only possible provider of service to the first three subscribers while anyone can serve the remaining three subscribers. That is, subscribers 1, 2, and 3 are in the set A of monopolized subscribers

5 The person-pair inverse demand curve is $P = 3 - Q_{ij}$ where P is the price per call and Q_{ij} is the number of calls from person i to person j. The corresponding marginal revenue curve is $MR = 3 - 2Q_{ij}$. Using the monopoly profit maximizing condition of marginal revenue equals marginal cost when marginal cost equals 1 yields a quantity of 1 and corresponding price of 2 for each person pair.

while subscribers 4, 5, and 6 are in the set B of competitive subscribers. There is no regulation of the prices that the monopolist can charge its own customers. In a standard market with no network externalities, these conditions would allow the monopolist of the A customers to extract monopoly profits from them, but would not allow the monopolist to extend its monopoly power to the B customers. The network nature of telephone service makes it possible for the monopolist to extend its power to the B customers through control of interconnection conditions. The best that an interconnection policy can do is to restrict the monopoly power to the set A. That is, a good interconnection policy will reduce potential monopoly profits from $30 (the level at which all customers pay monopoly prices) to $15 (the level at which A customers pay monopoly prices and B customers pay competitive prices). No interconnection policy in itself can reduce the monopoly power over A customers, but a poorly functioning interconnection policy can allow the monopoly to be extended to part or all of the calls from the potentially competitive B customers as well. The monopoly extension occurs because a poorly functioning interconnection policy limits the ability of carriers in B to terminate calls on A's monopoly network and may make competition in B infeasible.

The following examples assume for simplicity that only linear pricing (a specified charge per call) may be used, though the price may be different for different classes of customers. Allowing more complex pricing plans (such as multiple combinations of fixed and usage charges) would produce different numbers but would not yield different conclusions.

III. No Fixed Costs per Subscriber

With no fixed costs per subscriber, the monopolist of A sets a price of $2 for AA calls (originating and terminating among customers of A), while the competitors that serve B set a price of $1 (equal to cost) for BB calls. The interconnection conditions determine the prices for AB and BA calls.

A. No Required Interconnection

If there is no interconnection requirement, A can monopolize the AB and the BA calls along with the AA calls, but cannot monopolize the BB calls in the absence of fixed costs. The monopolist of A can guarantee itself access to the customers of B either by purchasing access from a current supplier or by establishing its own affiliate to serve B. Competition in B means that no one can charge more than $.50 (the cost of termination) for terminating calls from A; otherwise, another competitor would offer to do it more cheaply. A will maximize profits from its monopoly by charging a price of $2.00 for AB calls (yielding a net profit of $1 per call after paying its own expenses of $.50 for originating and the competitive termination fee of $.50), and charging an access fee of $1.50 for BA calls.

Because B is competitive and the cost of originating calls is $.50, the B competitors will charge $2.00 for BA calls, just equal to their total cost of $.50 for origination and $1.50 for termination.

Under these conditions, the equilibrium is full monopoly pricing of $2.00 per call for AA, AB, and BA calls (each yielding a net profit above cost of $1.00 per call) and competitive pricing of $1.00 per call for BB calls (equal to the cost of service and thus yielding a net profit above cost of zero). The monopolist of A will make a profit of $24 ($1 each on the 24 total calls made at a price of $2.00 for AA, AB, and BA calls). There will be 12 BB calls at a price of $1.00 each, yielding a net profit of zero. If there had been a complete monopoly of both A and B, the potential profits in this situation would have been $30 (including the $24 realized profits and the $6 unrealized profits that would have come from pricing BB calls at the monopoly level of $2.00 each). The monopolist of half of the subscribers makes 80 percent of the total possible monopoly profits because of its control of interconnection conditions. In other words, bringing competition to half of the subscribers only reduced monopoly power by 20 percent.

B. Required interconnection with mutual compensation

In this situation, companies are required to provide interconnection with each other, and are required to charge and receive the same rate. That is, whatever one company charges for terminating calls must be the same rate it pays the other company for terminating calls. As in the first case, the monopolized AA calls will be charged at the pure monopoly rate of $2.00 and the competitive BB calls charged at the cost-based rate of $1.00 each. Now, however, the situation above in which A charges $1.50 for terminating calls received from B and pays $.50 to B for B's service in terminating calls received from A is disallowed because the rates must be the same.

While this case appears to reduce A's monopoly power, it generally does not affect it at all. Only in the very specialized case of exactly balanced traffic does mutual compensation without control of rates limit A's monopoly power. More generally, A can use its control of the actual compensation rate together with traffic imbalances to maintain its monopoly power. Because anyone can enter the service of B, the monopolist of A can establish an affiliate that serves B. The monopolist of A can then set a compensation rate that allows it to maximize profits in both the A and B market segments while making it infeasible for competitors in B to serve traffic from B to A. For example, the monopolist of A could set a compensation rate of $2.00 for terminating any traffic received from A and also agree to pay $2.00 for any traffic delivered either to its own affiliate or to other competitors in B. For a carrier in B that is not affiliated with the monopolist of A, the competitive price for traffic from B to A is then $2.50 ($.50 cost of originating the traffic plus $2.00 paid to the monopolist of A for terminating the traffic). However, the affiliate of A will set a price of $2.00 for B to A traffic because that is the profit maximizing price for the total company. The difference in pricing comes because the non-affiliated company sees the $2.00 payment to the monopolist of A as a real cost that must be recovered in the price charged, whereas the affiliated company sees the $2.00 payment as an internal company transfer that does not affect the real cost of doing business. For the affiliated company, the size of the payment affects which entity reports the profits, but it does not affect the total profit of the combined enterprise.

Because the affiliated company prices B to A traffic at $2.00 while the non-affiliated companies price the same traffic at $2.50, customers will choose the affiliated company. Once the affiliated company monopolizes the B to A traffic, it will naturally receive the A to B traffic as well. The profit maximizing solution for the monopolist of A and its affiliate in B is consequently to set a high compensation rate (any rate above $1.50) and to price all traffic at the monopoly price of $2.00, even though some of the traffic will show high profits and some will show losses if the specified compensation rates are taken into account. The total profits of the monopolist of A and its affiliate remain at $24 or 80 percent of the total potential just as in the case of no required interconnection. Customers pay the same prices as in the case of no required